III-4-1 Major R&D projects

(1) The Japan Gigabit Network

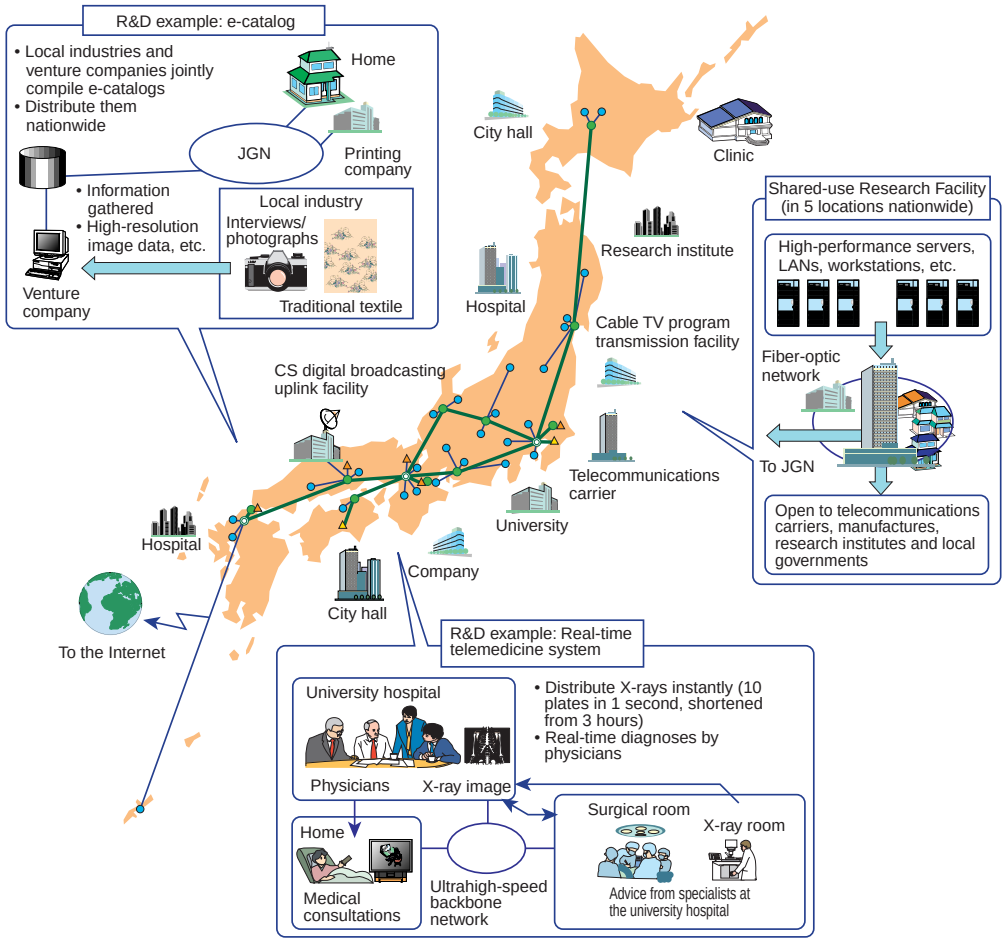
Work has begun on next-generation, ultra high-speed network technologies.

With the aim of developing ultra high-speed networks for use in the 21st century, the Telecommunications Advancement Organization of Japan (TAO) completed construction of the Japan Gigabit Network (JGN) during fiscal 1998. JGN consists of the Gigabit Network Link which links 10 advanced ATM switching facilities nationwide with ultra high-speed fiber-optic links, and five Shared-Use Research Facilities for advanced R&D activities. To facilitate easy access to the Gigabit Network Link, 45 network access points were also set up nationwide (Refer to Appendix 43).

From fiscal 1999 to 2003, the JGN will be made open to research institutes, universities, companies and other organizations to conduct R&D of high-speed networking and high-performance application technologies such as the Next-Generation Internet technology. It is expected that a variety of applications will result, such as systems to instantly machine-translate documents in various languages over the network; systems to distribute high-resolution e-catalogs throughout Japan, and systems to enable realtime telemedicine.

During fiscal 1999, TAO will also conduct its own research activities using the JGN. In addition, it will invite the public to suggest research themes for creating highly sophisticated applications, and it will then entrust or jointly carry out experiments on the most viable themes.

Fig. Outline of the Japan Gigabit Network



Related site: Telecommunications Advancement Organization of Japan (TAO) (http://www.shiba.tao.or.jp)

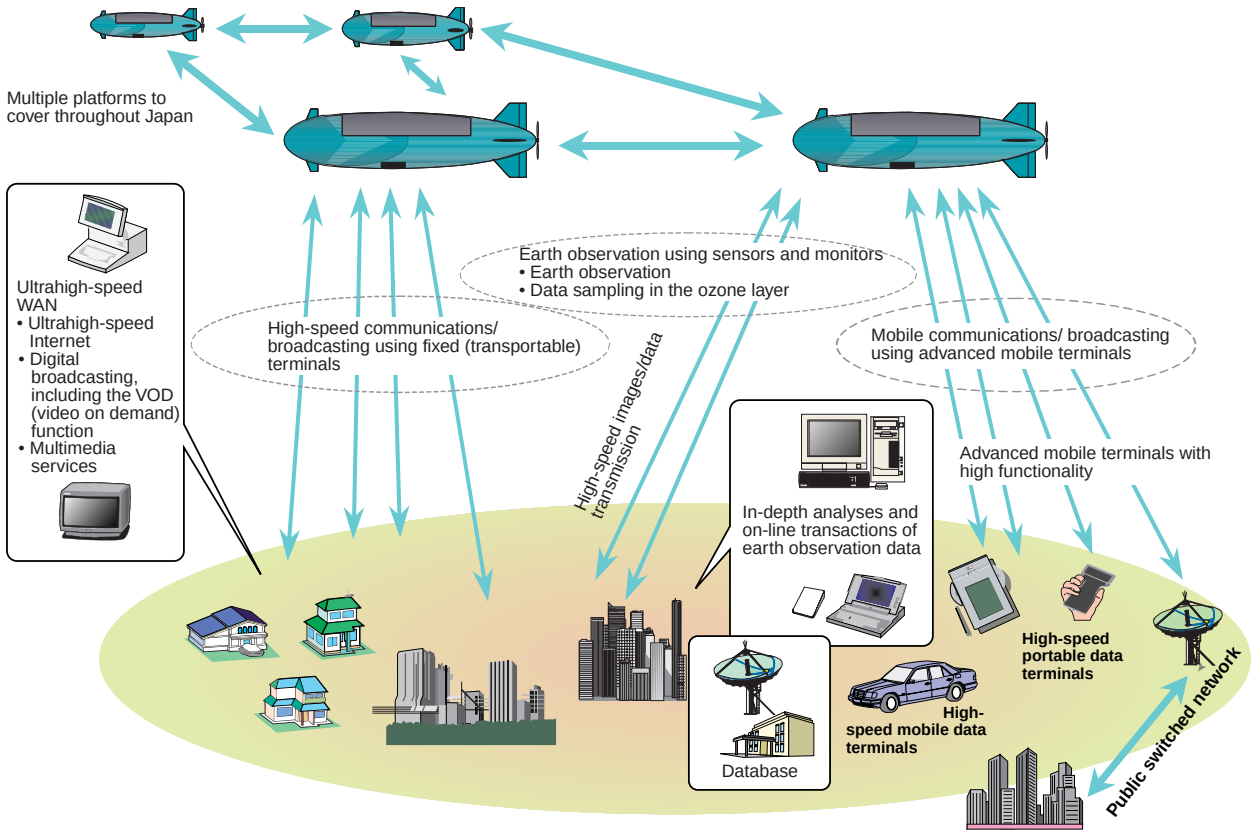
(2) R&D on stratospheric platforms

Toward realization of airship-borne stratospheric radio relay systems

Stratospheric platforms are radio relay stations in unmanned airships that are flown in the stratosphere at an altitude of approximately 20 km, where weather conditions are relatively mild and stable. The platforms, to be used for relaying communications and broadcasting, are expected to become an integral part of the next-generation info-communications infrastructure. With observation sensors on board, the platforms can also be used for Earth observation and various other purposes.

MPT and the Science and Technology Agency have jointly been pursuing research and development work, in cooperation with industry and academia, to make the stratospheric platforms suitable for communications, broadcasting and Earth observation at the earliest possible date. In August 1998, an MPT measure, the "Stratospheric Platform Project" was launched by TAO, which has begun research and development of the platform tracking control system, as well as the creation of communications and broadcasting applications that use Ka-band and millimeter radio waves.

Fig. Outline of R&D on stratospheric platforms



Expected advances

1. Achievement of the next-generation info-communications infrastructure based on high-speed, large-capacity communications and broadcasting networks, which will use previously unexploited frequencies, such as millimeter waves.
2. Creation of high-speed, mobile, multimedia communications via small terminals, taking advantage of the shorter distance to the ground than satellites.
3. Strengthening of Japan's international competitiveness through the original development of these technologies.
4. Use of the stratospheric platforms for environmental observations, such as of the ozone hole and the oceanic ecosystem.

(3) Total optical communications technology

Projects are under way to develop optical communications technologies to meet the expected dramatic rise in demand for very large capacity transmissions.

As socioeconomic activities become increasingly dependent on info-communications, it is crucial to find ways to transmit bulk information over networks at low cost. The amount of information distributed over networks is expected to increase dramatically, and the information is likely to contain more and more high-resolution animation in addition to conventional voice data and still images.

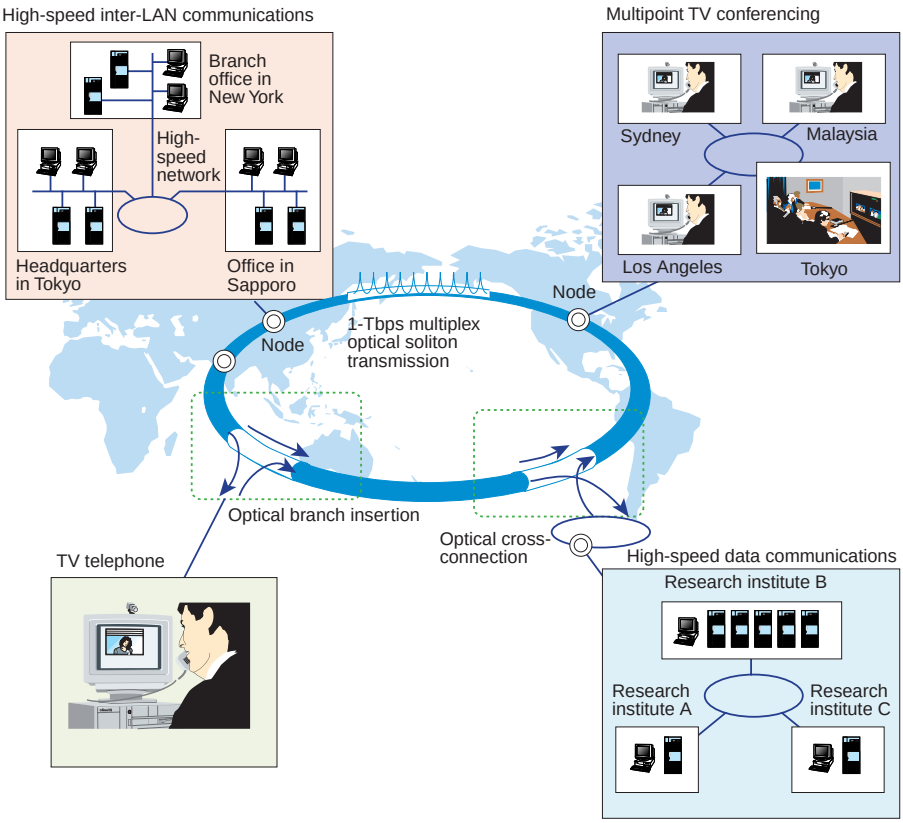
Total optical communications technology will enable end-to-end communications without the need for optical signals to be converted into electrical signals. It is therefore a very important research theme at the dawn of a new era of large-capacity communications.

During fiscal 1998, MPT initiated research and development of the technologies needed to transform all communications networks into optical ones, with the aim of creating ultra large-capacity backbone relay systems that can deal with about 1,000 times more than the current volume of communications required by households. The ministry also conducted research into plastic optical fibers, which are cheaper than silica optical fibers and yet are capable of easy connection and branching: important factors for the development of large-capacity and flexible total optical communications networks.

During fiscal 1999, MPT will continue its research and development activities, with the aim of constructing ultra-large-capacity wideband total optical communications networks. These are expected to achieve transmission speeds of several hundreds Gbps in subscriber loops, and ranging from 160 Gbps to 1 Tbps in the relay networks.

(Reference)
- 1 Tbps is a transmission speed equivalent to sending 200 years' issues of a typical daily newspaper in one second.
- 1 Gbps is a transmission speed equivalent to sending about 10 weeks' issues of a typical daily newspaper in one second.

Fig. Outline of a total optical communications technology project



(4) Promotion of R&D on the Multimedia Mobile Access Communications (MMAC) systems

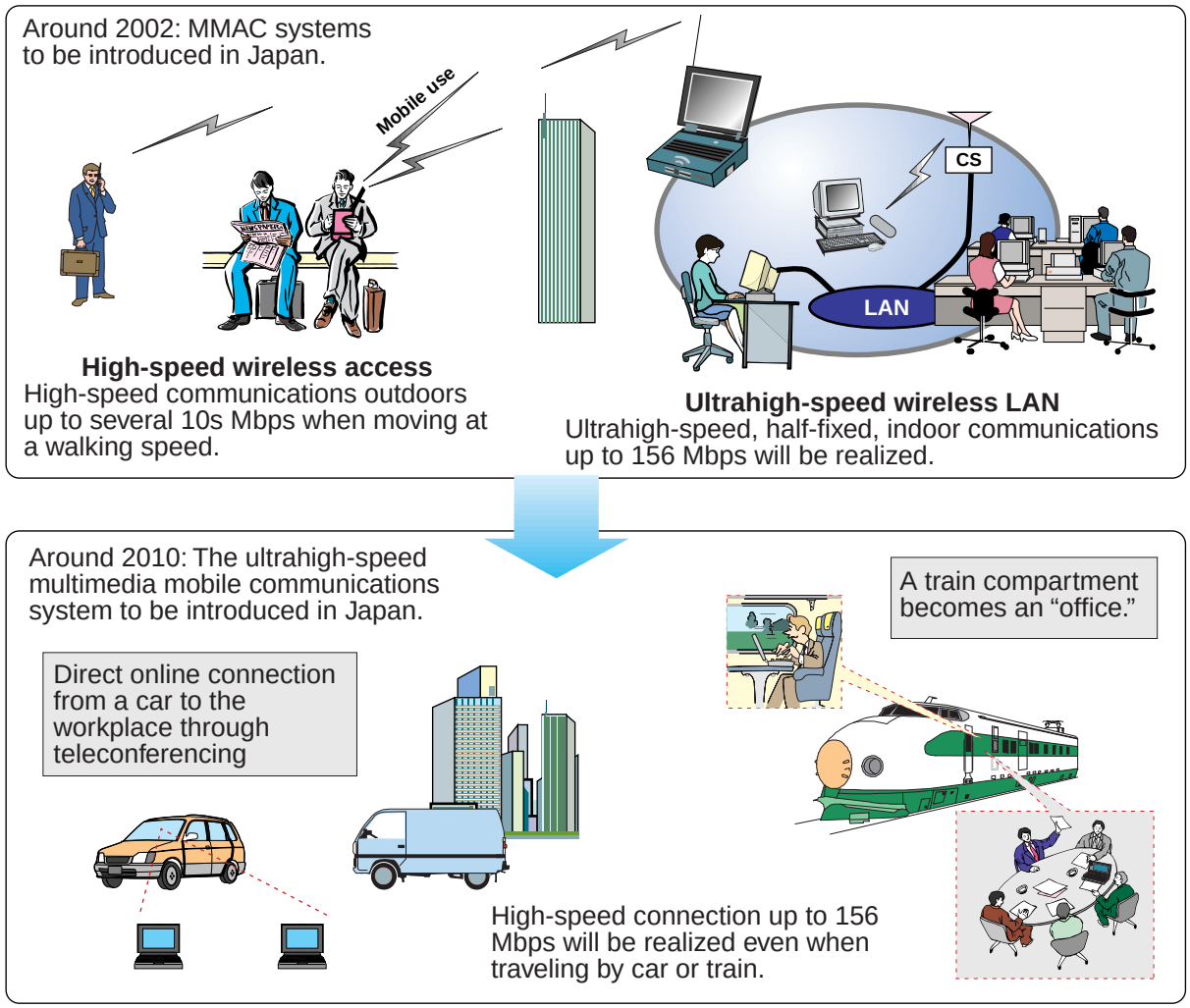
By 2002, high-speed wireless communications will allow people to exchange high-quality video and other data on the move.

Multimedia Mobile Access Communications (MMAC) systems that can transmit ultra-high-speed, high-quality multimedia information anytime and anywhere with seamless connection to fiber-optic networks. With MMAC systems in place, it can be used for high-quality mobile video-conferencing, mobile video-telephony and other services.

MPT aims to establish MMAC systems in Japan by 2002, so that ultra high-speed wireless LANs can be set up in business premises and high-speed wireless communications be provided outdoor. In addition, MPT is promoting the research and development of an advanced "Ultra high-speed multimedia mobile communications system," which can transmit data at up to 156 Mbps, even on the move. MPT expects the system to be established in Japan around 2010.

Meanwhile, in fiscal 1999 MPT will continue a range of research and development of a control system technologies for switching from one communications area to another on the move, as well as development of equipment and mobile access technologies.

Fig. Promotion of MMAC systems



III-4-2 Basic Research 21 for Breakthroughs in Info-communications

Promotion of projects aimed at accomplishing breakthroughs ushering in info-communications into the 21st century.

In fiscal 1998, MPT began promoting a research project called "Basic Research 21 for Breakthroughs in Info-communications," to be pursued through interdisciplinary approaches involving experts from a wide range of fields in the sciences and humanities.

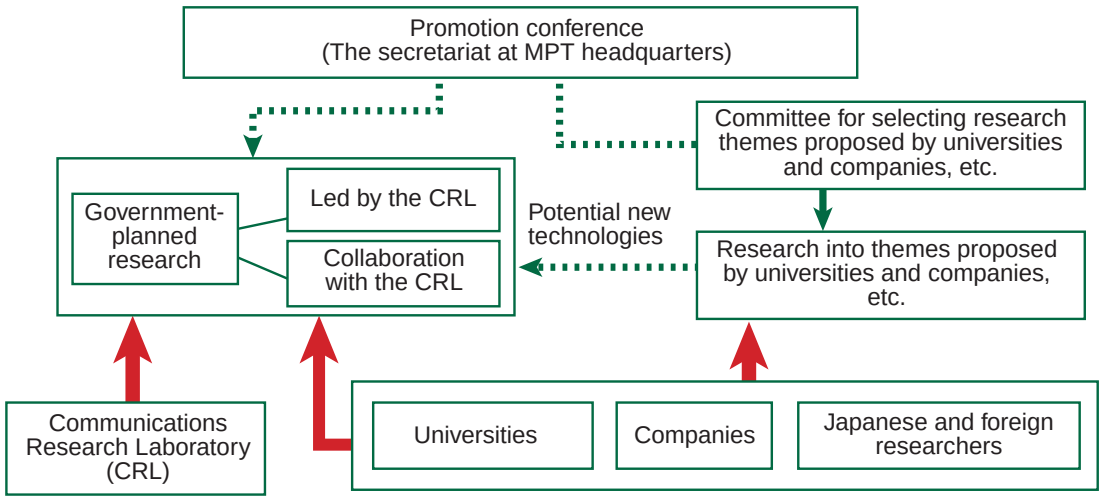
The aim of the project is to identify areas that will result in important breakthroughs in the info-communications field in the 21st century. Specifically, it follows two approaches: government-planned research and research on themes proposed by universities and companies. The former is being conducted on the three important themes shown in the Table, under the direction of MPT's Communications Research Laboratory (CRL), in cooperation with industry and academia. The latter is being conducted on themes proposed by universities and companies, with the aim of exploring new growth areas for technology (Fig.).

In fiscal 1998, as part of the government-planned research, a study was launched on human behavior in a communications-oriented society and to apply the findings to info-communications technologies. Another study focused on the dynamic memory mechanisms of the human brain.

Table Three major research themes

Theme	Breakdown	Areas of study
Research for friendly communications society	Elucidation of such human communication mechanisms as languages, memories and understanding; research into the modeling of these communication mechanisms; and study into human behaviors involving communication over the network	Psychology Linguistics Sociology, etc.
Research to explain and apply functions of life to info-communications technology	Measurement and elucidation of the information conveyance, storage, processing mechanisms and functions innate to life, at all levels -- from molecules to brain cells -- and research into ways to apply these findings for the future info-communications technologies	Biology Biotechnology Instrumentation optics, etc.
Research on new functions and ultimate technology	Studies aimed at developing highly sophisticated info-communications devices of the future through research into new functions and technologies applicable to extreme conditions, including substance control/measurement technologies, superconductivity element technologies and molecular element technologies	Material science Optics Quantum physics, etc.

Fig. System for Basic Research 21 for Breakthroughs Promotion



Related site: Communications Research Laboratory (CRL) (http://www.crl.go.jp)

III-4-3 Construction of the Multimedia Virtual Laboratory

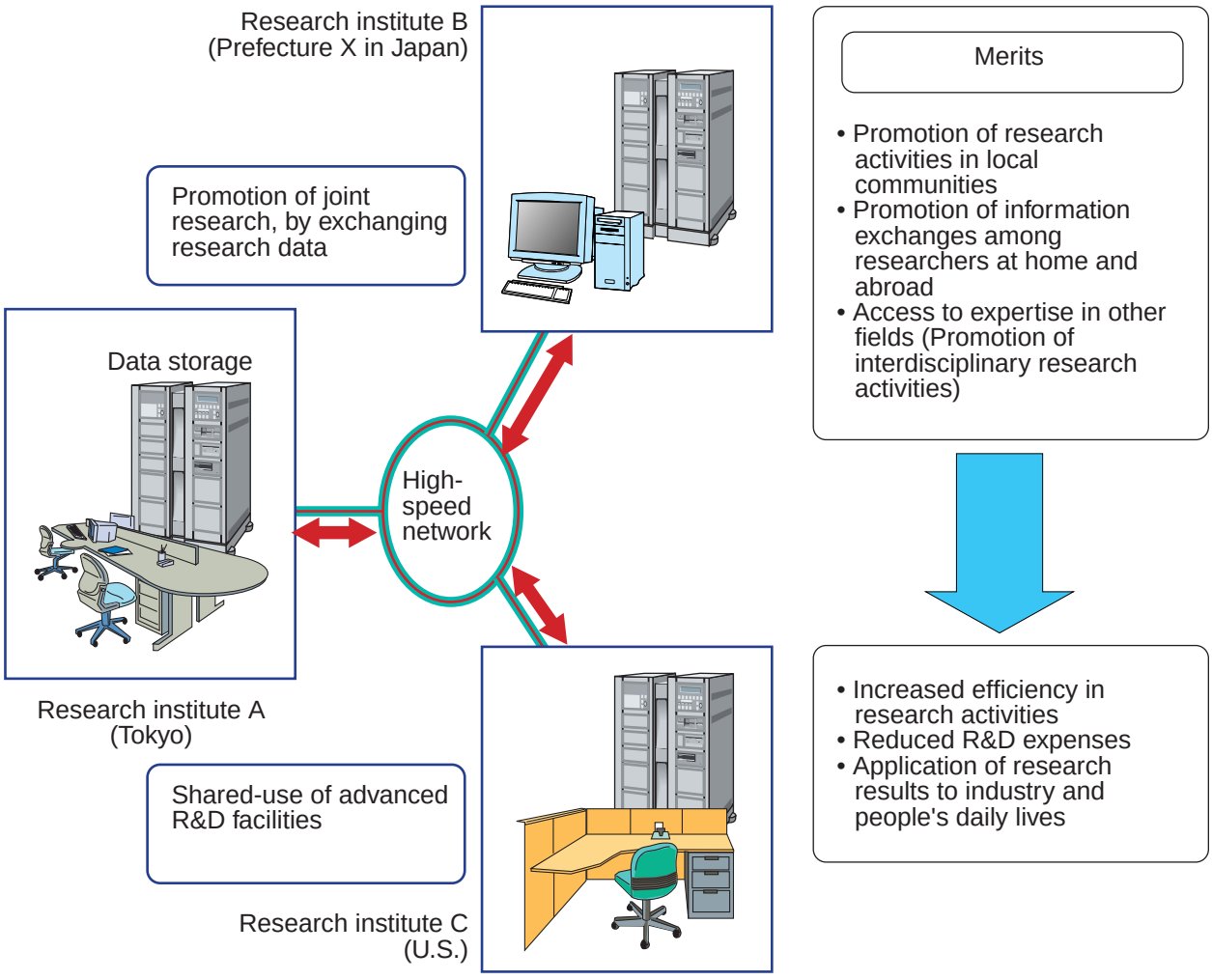
Researchers around the world can be brought together through advanced communications.

The Multimedia Virtual Laboratory (MVL) is a project to interconnect research institutes in the government, industrial, and academic sectors worldwide via high-speed networks, bringing together researchers and their expertise as if they were in the same laboratory.

MPT is promoting field trials aimed at establishing the MVL at the earliest possible date (Fig.), and efforts are under way at CRL and TAO to make the concept into a reality. These organizations are working on the following research themes:

1) Basic technologies, such as those for exchanging video and sound data at the highest possible quality among geographically distant research institutes; and,
2) Network utilization technologies crucial to the realization of the MVL, by preparing and using a wideband network prototype interconnected with experimental networks of research institutes in the U.S. and Europe.

Fig. Outline of the Multimedia Virtual Laboratory



Related sites: Communications Research Laboratory (CRL) (http://www.crl.go.jp); Telecommunications Advancement Organization of Japan (TAO) (http://www.shiba.tao..or.jp)

III-4-4 Development of Gigabit satellite networks

R&D has begun on developing next-generation network technologies.

The full development of Gigabit-class ultrahigh-speed satellite communications technologies, with transmission speeds about the same as those in fiber-optic networks, is crucial to the preparation of the global info-communications infrastructure. With the launch of a Gigabit satellite scheduled for early in the 21st century, MPT began researching and developing Gigabit satellite communications technologies that will lead to large-capacity, ultrahigh-speed communications (Table and Fig.).

After the launch of the satellite, MPT will conduct technology verification tests in orbit, and will collaborate with countries in the Asia-Pacific region to promote the introduction of Gigabit satellite communications systems into the region. Specifically, MPT and those countries will jointly develop high-speed, broadband satellite communications applications for educational, medical and academic purposes, and then conduct joint experiments on those applications. Among the research themes planned for fiscal 1999 are:

1. Satellite-borne ultrahigh-speed communications equipment

Research and development will focus on finding ways to make devices mountable and workable on satellites, such as scanning spot-beam antennas, ultrahigh-speed onboard switches and ultrahigh-speed inter-satellite optical communications equipment. Efforts will also be made to develop communications systems and protocols suitable for Gigabit satellite communications systems.

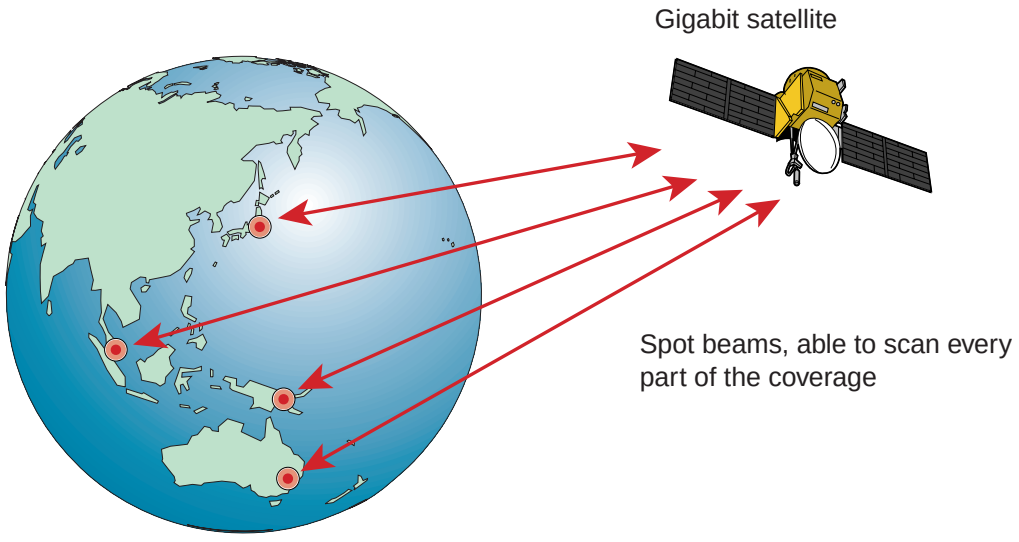
2. International joint research

Aiming for the construction of Gigabit satellite communications systems in the Asia-Pacific region, the participants will discuss what Gigabit systems would be desirable, as well as their role in developing terrestrial networks. As part of this collaboration, an international forum will be convened.

Table Characteristics of Gigabit satellite networks

1. Ultrahigh-speed communications possible at the maximum speed of 1.2 Gbps
2. The Gigabit networks will cover the entire footprint of the Gigabit satellite, the Asia-Pacific region.

Fig. Outline of the Gigabit satellite



Coverage of a Gigabit satellite at 150 °E